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Intellischool: A Student Information System for Senior High School

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Abstract

An IntelliSchool: A Student Information System (SIS) for Senior High School (SHS) is a software application intended to oversee and simplify different aspects of student-related academic information efficiently. This study aimed to ensure data accuracy and consistency, develop a paperless and web-based class record, ensure fairness and transparency in generating forms, and enhance parent-school communication and involvement by incorporating a messaging system. Descriptive-developmental approach was employed in this study. Interviews and direct observation of transaction processes were used as data collection methods in developmental approach. The software development life cycle (SDLC) adopted was Rapid Application Development (RAD), encompassing stages from requirements planning, user design, development, and system launch. The system was developed using Code Igniter PHP Framework, MySql, JQuery, and Code Espresso SMS Gateway technologies. In descriptive approach, test case to check systems functionality and Post Study System Usability Questionnaire (PSSUQ) were administered sequentially to 5 IT experts and 35 end-users. In data analysis, standard mean was employed. The test case obtained "passed" rating. In PSSUQ, overall mean is 1.21 across system usefulness, interface quality, and information quality. The system has undergone pilot implementation through locally hosted network infrastructure, fulfilling its intended nature and purpose. The recommendation was to use a server that accommodates users without sacrificing the system's performance.

Keywords: Student Information System, senior high school, test case, Post Study System Usability Questionnaire (PSSUQ), Rapid Application Development (RAD), Philippines

1. INTRODUCTION

Student Information System (SIS) is a resource that offers a self-service solution for faculty and staff to get their administrative tasks done in one place and can support them by helping simplify and integrate work processes [1]. According to Grand View Research, the global market size of the SIS industry was valued at $7.41 billion in 2021. About 35% of public schools in US revealed that their teachers use EdTech for classroom work that they would not do without the help of technology [2]. North America had the highest adoption rate of SIS in 2020 [3]. As the world navigates, academic institutions have also started to fully embrace the new education age by incorporating advanced technologies digitalizing school operations that play a crucial role in a school's transition to modern operations such as SIS [4].

In Asian countries like Indonesia, Gaffar et al. [5] showed that the digitalization of SIS has improved the schools' management quality, making it easier for users to do their jobs according to their levels and positions, and store the school's database neatly and securely. Agarwal et al. [6], in India perceives that SIS software is essential for all educational institutions in storing student information and can save much institutional expenditures. Also, it saves the use of paper. Ismail et al. [7] believes that the SIS includes the courses, curricula, academic departments, or programs offered within each faculty or school. One advantage it offers is establishing a centralized database for student information that can diminish errors and enhance the data precision since information is entered only once and subsequently becomes accessible throughout the entire system [8].

In Philippines, based on the Department of Education Memorandum No. 00-0921-0209, the Digital Rise Program is an educational framework anchoring the infrastructure, software, and capacity building of learners and teachers in technology. The Department established collaborations with Microsoft and Google to ensure a consistent supply of software tools to support teachers in tasks such as overseeing student records and facilitating the submission of necessary documents [9]. In 2015, the Learners Information System (LIS) is implemented as an online facility registering the learners enrolled in schools and licensed

by the Philippine Department of Education (DepEd). Meanwhile, SIS is designed for SHS as a software application to efficiently oversee and simplify different aspects of student-related academic information. Hence, automation in the current manual processes is necessary to manage student information efficiently. Specifically, this system handles every aspect of student data, from admission, class schedules, subjects enrolled, overall performance, and their personal information [10].

In the context of the locale, it relies on the manual processing system for various transactions within its instructional and administrative units. This approach involves physical documentation, manual calculations, and manual submission of various forms and reports. This also involves traditional, paper-based handling of tasks and generating required reports. However, these processes are more prone to errors because they involve human intervention, which can lead to mistakes when entering data and processing transactions [11]. Likewise, this manual system poses challenges when accessing student information from various offices, and retrieving student information is not straightforward, leading to slow transactions, data redundancy, and the potential risk of unsecured files.

In this institution, there is a pre-printed enrollment form for students to fill out during enrollment. The teachers use different forms and encode the same data, leading to data inaccuracy and inconsistency. They use downloadable electronic class records in Microsoft Excel to compute the students' grades, but they manually compute the final grade to determine the honor students. More papers are being utilized to print the different forms. To improve the efficiency and accuracy of data management, the institution should consider implementing an integrated and automated system. Such a system could help reduce data inconsistencies, enhance transparency, and enable educators to focus more on teaching and less on administrative tasks, ultimately benefiting students and staff.

Numerous systems have been developed for SIS that provide features such as student profiles and grade viewing. There are also classroom-based learning management systems (LMS) that require active interaction between the students and teachers. In contrast, others focus on managing various school processes [12]. Parent-specific portals allow guardians to access information on their student's attendance, academic planning, behavior, and communicate with teachers [1]. The centralization can effectively diminish errors and enhance the precision of data since information is entered only once and subsequently becomes accessible throughout the entire system [8]. However, up to this point, the researcher has not encountered any SIS designed specifically for SHS. There is a lack of systems that enable easy generation of School Form 9 and School Form 10 and other reports using data extracted directly from the class records, which leads to the research gap that this study seeks to fill.

Thus, this paper revolved around enhancing the efficiency and accuracy of data across all levels in senior high school (SHS), accessibility of web-based class records, enhanced communication among teachers, students, and parents, and generating school forms. The researcher conceptualized an information system named IntelliSchool as a student information system for SHS.

2. PROJECT CHARTER

The researcher proposed a system that would improve the school's processes. Specifically, the senior high school SIS aimed to ensure data accuracy and consistency by developing a standardized data entry protocol and a central database for seamless integration and verification of student data from various sources. Also, it developed a paperless and web-based class record for every teacher that will automatically compute the students' transmuted grades. Likewise, it ensured fairness and transparency in generating school forms and determining honor students. It also minimized errors and bias and provides consistent reports. Lastly, it enhanced the parent-school communication and involvement by incorporating a messaging system that informs parents about important school activities to improve parental awareness and active engagement in their child's education.

The proposed SIS has this essential functions. It allows teachers to conveniently upload School Form 1, which contains essential student information, directly from the DepEd LIS. It also provides a web-based platform for teachers towards class record management. Advisers can view their students' grades, generate School Form 9 (Report Card) and School Form 10 (Permanent Record), and determine honor students. Interestingly, this will also generate certificates of recognition for honor students quarterly, automating the

process and reducing manual paperwork. The students and parents can view grades by opening the system through their accounts. The system will enable advisers to send SMS messages to students and parents ensuring that important school announcements are promptly conveyed. It also provides a message box for advisers to send personalized messages to students, parents, or both. Lastly, this adds and manages teachers' class schedules so that they can easily be supervised and provides class schedules that allow administrators or teachers to assign students to their respective classes.

In planning, analysis and development, the researcher used the Rapid Application Development (RAD) Model to develop the system. RAD is a linear sequential software development process model emphasizing a concise development cycle using an element-based construction approach [13]. The first phase entails the *requirements planning* where the project goals, expectations, and potential issues are determined. This includes researching the current problem, identifying the project requirements, functionalities, features, constraints that the project must satisfy, and the requirements' finalization. Secondly, the *user design* manifests the researcher and developer's translation of the requirements into a tangible design which involve prototyping, testing, and iterative design refinement. The third phase is the *development* which focuses on program and application development, coding, unit, integration, and system testing to ensure everything is working smoothly and that the result satisfies the organization's expectations. The final stage is the *system launch* which marks the completion encompassing data conversion, testing, transitioning to the new system, and conducting user training [14].

In implementation strategy, the researcher used the *parallel deployment*. Here, the old and new systems operate. An advantage of using both systems is comparing new and old information. This helps in finding mistakes on how the new system handles data [15]. Given that the SHS will be using the new system while the junior high school (JHS) will continue use the old system, running both systems makes a practical idea. It allows the new system to be thoroughly tested and validated by the SHS's usage while maintaining the established system for the JHS.

Meanwhile, project documentation is a collection of data and documents that captures project information, and its purpose is to gather all documents to make referencing and communication easier [16]. Various methods are available to collect and gather this data, but the researcher chose two methods. The primary method was interviews with key informants allowing the researcher to ask open-ended questions, which is useful in designing the User Interface (UI) and Data Processes [17]. The second involves collecting forms and reports. Here, data documents like enrolment forms, grading system, etc. were gathered.

Lastly, to maintain the paper's integrity, the researcher maintained specific measures related to informed consent, privacy, and data confidentiality. The process ensured voluntary participation and demonstrate respect for the participants' rights. Data confidentiality and respondents' anonymity were carefully upheld. Their privacy was protected by securely storing and handling their data. In disposing the data, proper measures, such as shredding and deletion, were taken to ensure the data's confidentiality.

3. FORMS

The existing system relies on various forms and reports, which serve as a reference in devising a new approach and ensure precise data for the implementation. The organizational forms include school form 1, enrollment form, list of students per section, electronic class record, grade sheet, summary of grades, certificate of recognition, school form 9 (SF 9), school form 10 (SF10), teacher's loading form and room utilization that is composed of class schedule and teacher's schedule, and letter for parent during meetings.

4. PROJECT TECHNICALITY

Project System Scope. The proposed SIS falls under the category of a school management system, aiming to effectively handle student-related information within an educational establishment upon its implementation. The system is locally hosted within the school's network infrastructure. Once operational, the system's main functionalities are to generate reports to fulfill the role of offering well-structured and thorough understanding of student performance, attendance, grades, and pertinent data.

The system encompasses data storage, management, retrieval, and report generation functionalities. Secure data and information storage are emphasized to prevent any potential loss. This security measure ensures the preservation and integrity of valuable information within the system. This system requires the encoding of data needed for every transaction. It allows the uploading of student information from the generated school form 1 of DepEd's LIS. Additionally, it supports encoding curriculum details, tracks, and strands with sections, subjects, teachers, schedules, and class records. User-entered data is subject to specific value types and character limitations defined by the system. It also caters to various users, including teachers, advisers, assistant principals, department heads, students, and parents.

The transactions encoded in the system include curriculum, strand, and subject management, scheduling classes and teachers, managing student profiles, managing class records, and generating reports. Moreover, the proposed system can produce records and reports. These reports encompass a diverse range, including curriculum outlines, class rosters, teacher assignments and schedules, student timetables, class records, School Form 9, School Form 10, student lists, and certificates of recognition for honor students.

Usage Scenario. The following users can perform the transactions in the system. The assistant principal through this system can manage strands, subjects, curriculum, loading, and generate reports. The adviser can manage student profile, enrolled student, and class record, change/add subject, view grades/class schedule, and generate reports. The teacher can manage class record, view grades/class schedule, and generate reports. The department heads can manage teacher's profile, view teacher's schedule, and generate reports. The scheduler can manage schedule, view schedule, and generate reports. The student can view grades/schedule and generate reports. Lastly, the parent can register their child, view grades/schedule and generate reports.

Software Interface Description. A graphical user interface (GUI) allows a user to interact easily with the computer, typically by making choices from displayed menus or groups of icons, and is used to gain user input for the system, as well as provide some restrictions on what the user can and cannot do [18]. The interface holds a significant importance in the system's overall perspective. It acts as a display to evaluate the system's quality, with an enhanced interface contributing to a more positive perception. A login form is a graphical user interface element used in the system to authenticate users by requiring them to provide unique credentials, typically a username and password.

Figure 1. *Login Form*

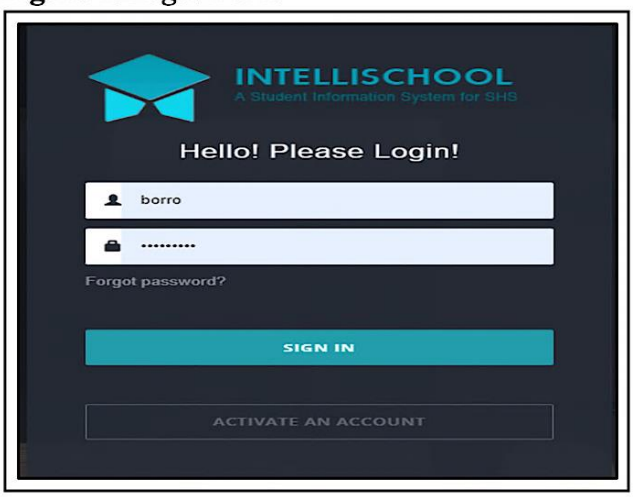

Figure 1 shows the *login form*. This is the gateway to access the system's secured area or specific functionalities. It is an essential component of user authentication and access control mechanisms. Only authorized individuals can access sensitive information, perform specific actions, or utilize restricted features.

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Figure 2. *Upload File*

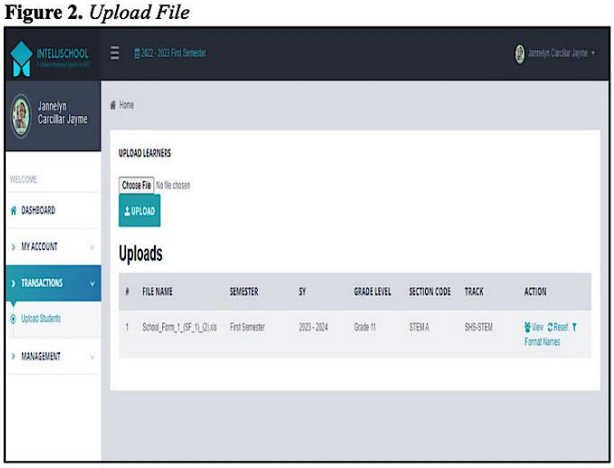

Figure 2 shows the *upload file interface*. This allows the adviser to upload the Microsoft Excel file of school form 1 containing the student's profile, downloaded from DepEd's LIS. The adviser clicks the *Choose File button* to browse the file location and then click the *Upload button*. The file's name and other details will appear. Click view in the action column to check the list of students.

Figure 3. *Enroll students in the strand*

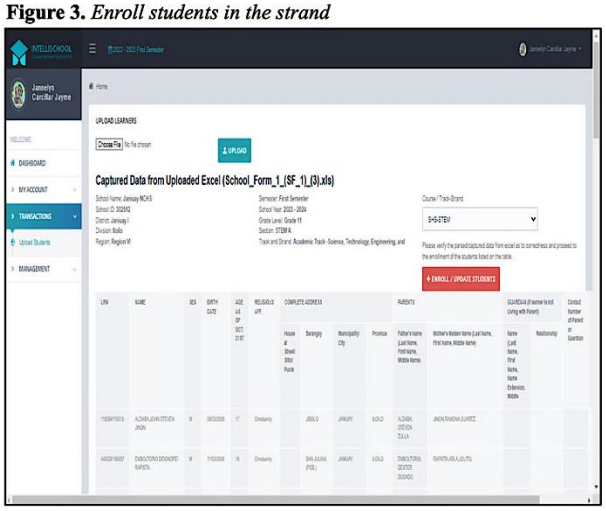

Figure 3 shows the *process of updating and storing students' information* in a specific strand and school year. This facilitates the efficient management of student records within the specified academic program. It also displays the user interface through which advisers can handle the enrollment and update procedures for students. It simplifies the data entry process, enhancing the overall organization of student information within the database. All the entries are stored in the system's database.

Figure 4. *Enroll students in the section and period*

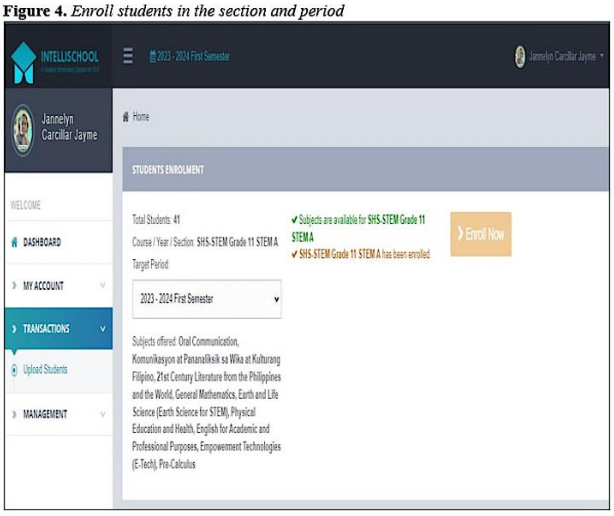

Figure 4 shows *the enrollment of students in the section and period*. This page allows the advisers to initiate the enrollment of all students in a specific section and period by simply clicking the enroll button. This simplified functionality enhances the efficiency of the enrollment process, providing a user-friendly experience for advisers. The enroll button offers a convenient and time-saving mechanism for advisers to manage the enrollment of all students within a designated section and period at once.

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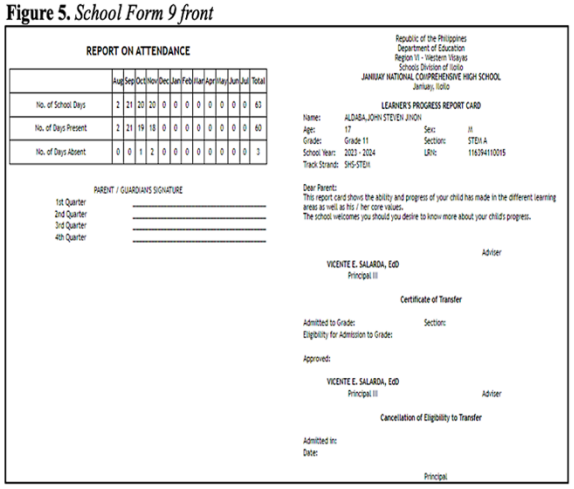
Figures 5 and 6 show the *school form 9 interface*. This compiles and displays all the student grades from all the subjects they have taken, the report of their attendance for the whole year, and values observed from them based on DepEd's core values. This comprehensive overview of student performance is presented within the school form 9 interface and is ready for printing. School form 9 typically consists of both a front and back pages, where various student data and grade information are organized and recorded. The integration of this functionality into an interface simplifies the process of generating this critical document, making it more convenient for advisers to access and print the necessary information for record-keeping and reporting purposes.

Figure 5. *School Form 9 front*



REPORT ON ATTENDANCE

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
No. of School Days	2	21	20	20	0	0	0	0	0	0	0	0	63
No. of Days Present	2	21	19	18	0	0	0	0	0	0	0	0	60
No. of Days Absent	0	0	1	2	0	0	0	0	0	0	0	0	3

PARENT / GUARDIAN'S SIGNATURE

1st Quarter _____
2nd Quarter _____
3rd Quarter _____
4th Quarter _____

Republic of the Philippines
Department of Education
Region VI - Western Visayas
Schools Division of Iloilo
JANIUAY NATIONAL COMPREHENSIVE HIGH SCHOOL
Janiuay, Iloilo

LEARNER'S PROGRESS REPORT CARD

Name: ALDABA,JOHN STEVEN JINON
Age: 17 Sex: M
Grade: Grade 11 Section: STEM A
School Year: 2023 - 2024 LRN: 116394110015
Track Strand: SHS-STEM

Dear Parent:
This report card shows the ability and progress of your child has made in the different learning areas as well as his / her core values.
The school welcomes you should you desire to know more about your child's progress.

Adviser

VICENTE E. SALARDA, EdD
Principal III

Certificate of Transfer

Admitted to Grade: Section:
Eligibility for Admission to Grade:

Approved:

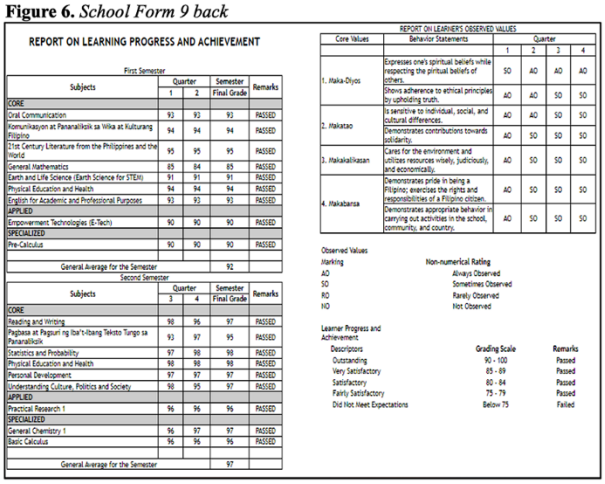
VICENTE E. SALARDA, EdD
Principal III Adviser

Cancellation of Eligibility to Transfer

Admitted In:
Date:

Principal

Figure 6. *School Form 9 back*



REPORT ON LEARNING PROGRESS AND ACHIEVEMENT

First Semester

Subjects	Quarter 1	Quarter 2	Semester Final Grade	Remarks
CORE				
Oral Communication	93	93	93	PASSED
Komunikasyon at Pananaliksik sa Wika at Kulturang Filipino	94	94	94	PASSED
21st Century Literature from the Philippines and the World	95	95	95	PASSED
General Mathematics	85	84	85	PASSED
Earth and Life Science (Earth Science for STEM)	91	91	91	PASSED
Physical Education and Health	94	94	94	PASSED
English for Academic and Professional Purposes	93	93	93	PASSED
APPLIED				
Empowerment Technologies (E-Tech)	90	90	90	PASSED
SPECIALIZED				
Pre-Calculus	90	90	90	PASSED
General Average for the Semester			92	

Second Semester

Subjects	Quarter 3	Quarter 4	Semester Final Grade	Remarks
CORE				
Reading and Writing	98	96	97	PASSED
Pagbasa at Pagsuri ng Iba't-ibang Teksto Tungo sa Pananaliksik	93	97	95	PASSED
Statistics and Probability	97	98	98	PASSED
Physical Education and Health	98	98	98	PASSED
Personal Development	97	97	97	PASSED
Understanding Culture, Politics and Society	98	95	97	PASSED
APPLIED				
Practical Research 1	96	96	96	PASSED
SPECIALIZED				
General Chemistry 1	96	97	97	PASSED
Basic Calculus	96	96	96	PASSED
General Average for the Semester			97	

REPORT ON LEARNER'S OBSERVED VALUES

Core Values	Behavior Statements	Quarter 1	2	3	4
1. Maka-Diyos	Expresses one's spiritual beliefs while respecting the spiritual beliefs of others.	SO	AO	AO	AO
	Shows adherence to ethical principles by upholding truth.	AO	AO	SO	SO
2. Makatao	Is sensitive to individual, social, and cultural differences.	AO	AO	SO	SO
	Demonstrates contributions towards solidarity.	AO	SO	SO	SO
3. Makakalikasan	Cares for the environment and utilizes resources wisely, judiciously, and economically.	AO	SO	SO	SO
4. Makabansa	Demonstrates pride in being a Filipino; exercises the rights and responsibilities of a Filipino citizen.	AO	SO	SO	SO
	Demonstrates appropriate behavior in carrying out activities in the school, community, and country.	AO	SO	SO	SO

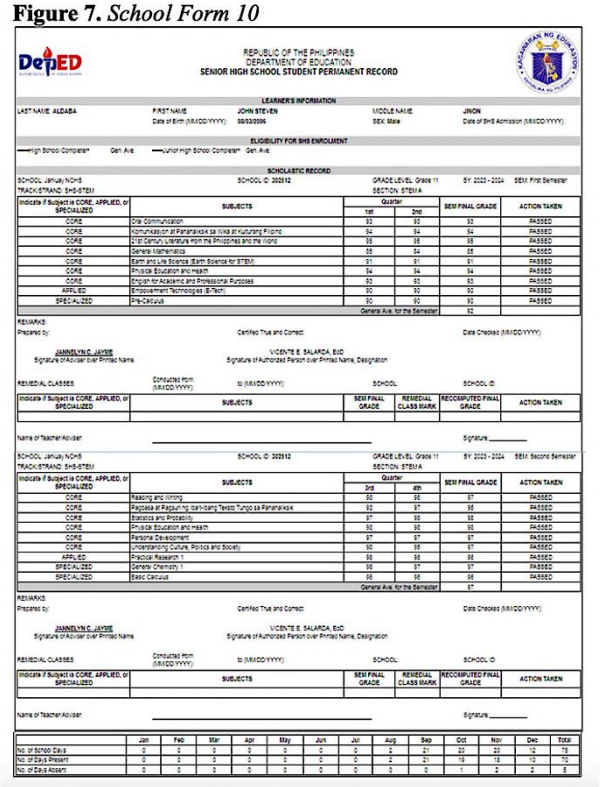
Observed Values

Marking	Non-numerical Rating
AO	Always Observed
SO	Sometimes Observed
RO	Rarely Observed
NO	Not Observed

Learner Progress and Achievement

Descriptors	Grading Scale	Remarks
Outstanding	90 - 100	Passed
Very Satisfactory	85 - 89	Passed
Satisfactory	80 - 84	Passed
Fairly Satisfactory	75 - 79	Passed
Did Not Meet Expectations	Below 75	Failed

Figure 7. *School Form 10*



REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF EDUCATION
SENIOR HIGH SCHOOL STUDENT PERMANENT RECORD

LEARNER'S INFORMATION

LAST NAME: ALDABA | FIRST NAME: JOHN STEVEN | MIDDLE NAME: JINON
Date of Birth (MM/DD/YYYY): 09/03/2006 | SEX: Male | Date of SHS Admission (MM/DD/YYYY):

ELIGIBILITY FOR SHS ENROLMENT

High School Completer — Gen. Ave. | Junior High School Completer — Gen. Ave.

SCHOLASTIC RECORD

SCHOOL: Janiuay NCHS | SCHOOL ID: 302512 | GRADE LEVEL: Grade 11 | SY: 2023 - 2024 | SEM: First Semester
TRACK/STRAND: SHS-STEM | SECTION: STEM A

Indicate if Subject is CORE, APPLIED, or SPECIALIZED	SUBJECTS	Quarter 1st	Quarter 2nd	SEM FINAL GRADE	ACTION TAKEN
CORE	Oral Communication	93	93	93	PASSED
CORE	Komunikasyon at Pananaliksik sa Wika at Kulturang Filipino	94	94	94	PASSED
CORE	21st Century Literature from the Philippines and the World	95	95	95	PASSED
CORE	General Mathematics	85	84	85	PASSED
CORE	Earth and Life Science (Earth Science for STEM)	91	91	91	PASSED
CORE	Physical Education and Health	94	94	94	PASSED
CORE	English for Academic and Professional Purposes	93	93	93	PASSED
APPLIED	Empowerment Technologies (E-Tech)	90	90	90	PASSED
SPECIALIZED	Pre-Calculus	90	90	90	PASSED
			General Ave. for the Semester	92	

REMARKS:
Prepared by: JANNELYN C. JAYME — Signature of Adviser over Printed Name
Certified True and Correct: VICENTE E. SALARDA, EdD — Signature of Authorized Person over Printed Name, Designation
Date Checked (MM/DD/YYYY):

REMEDIAL CLASSES: Conducted From (MM/DD/YYYY): to (MM/DD/YYYY): SCHOOL: SCHOOL ID:

Indicate if Subject is CORE, APPLIED, or SPECIALIZED	SUBJECTS	SEM FINAL GRADE	REMEDIAL CLASS MARK	RECOMPUTED FINAL GRADE	ACTION TAKEN

Name of Teacher/Adviser: _____ Signature: _____

SCHOOL: Janiuay NCHS | SCHOOL ID: 302512 | GRADE LEVEL: Grade 11 | SY: 2023 - 2024 | SEM: Second Semester
TRACK/STRAND: SHS-STEM | SECTION: STEM A

Indicate if Subject is CORE, APPLIED, or SPECIALIZED	SUBJECTS	Quarter 3rd	Quarter 4th	SEM FINAL GRADE	ACTION TAKEN
CORE	Reading and Writing	98	96	97	PASSED
CORE	Pagbasa at Pagsuri ng Iba't-ibang Teksto Tungo sa Pananaliksik	93	97	95	PASSED
CORE	Statistics and Probability	97	98	98	PASSED
CORE	Physical Education and Health	98	98	98	PASSED
CORE	Personal Development	97	97	97	PASSED
CORE	Understanding Culture, Politics and Society	98	95	97	PASSED
APPLIED	Practical Research 1	96	96	96	PASSED
SPECIALIZED	General Chemistry 1	96	97	97	PASSED
SPECIALIZED	Basic Calculus	96	96	96	PASSED
			General Ave. for the Semester	97	

REMARKS:
Prepared by: JANNELYN C. JAYME — Signature of Adviser over Printed Name
Certified True and Correct: VICENTE E. SALARDA, EdD — Signature of Authorized Person over Printed Name, Designation
Date Checked (MM/DD/YYYY):

REMEDIAL CLASSES: Conducted From (MM/DD/YYYY): to (MM/DD/YYYY): SCHOOL: SCHOOL ID:

Indicate if Subject is CORE, APPLIED, or SPECIALIZED	SUBJECTS	SEM FINAL GRADE	REMEDIAL CLASS MARK	RECOMPUTED FINAL GRADE	ACTION TAKEN

Name of Teacher/Adviser: _____ Signature: _____

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
No. of School Days	0	0	0	0	0	0	0	2	21	20	20	12	75
No. of Days Present	0	0	0	0	0	0	0	2	21	19	18	10	70
No. of Days Absent	0	0	0	0	0	0	0	0	0	1	2	2	5

Figure 7 shows the *school form 10 interface*. This displays the students' permanent record. It shows the students' academic history, documenting their progress from the first day of school through graduation. This historical data includes grades, subjects taken, attendance, and achievements, providing a complete overview of the student's educational journey.

Figure 8. *Send Individual SMS*

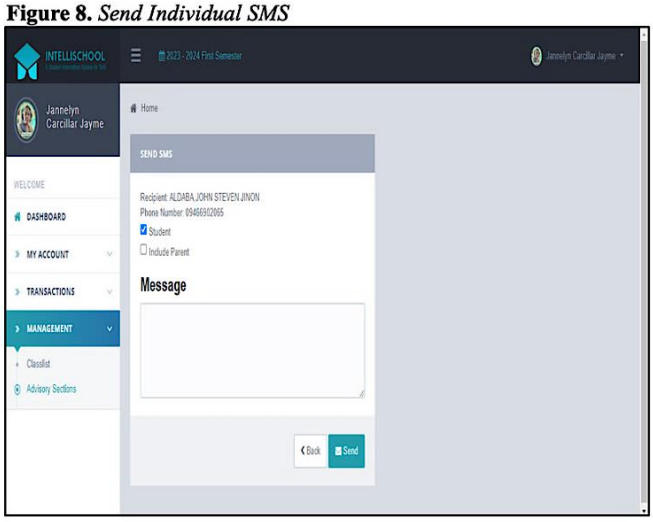


Figure 8 shows the *send individual SMS interface*. This allows the adviser to compose and send messages to students and their parents concerning issues. It is essential because it allows advisers to communicate openly and efficiently with students and parents, address issues promptly, and provide personalized support. It contributes to a positive and supportive educational environment while respecting privacy and confidentiality.

Figure 9. *Send Group SMS*

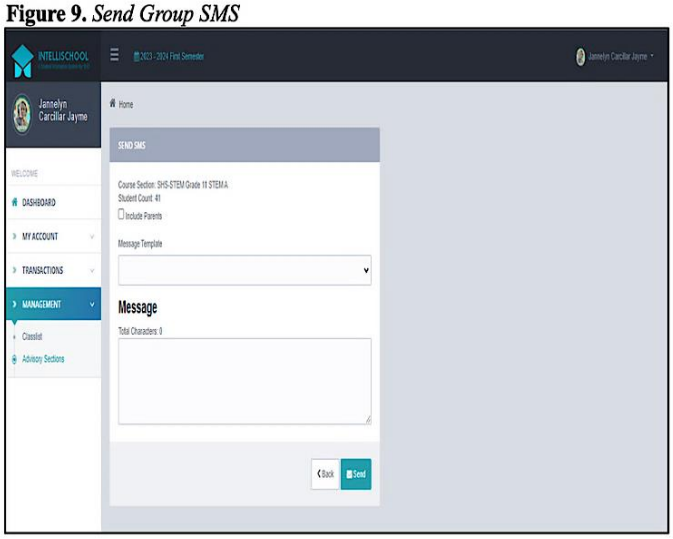


Figure 9 shows the *group messaging interface for sending SMS messages*. This enables advisers to send a text message to the entire class with a single click. Additionally, there is an option to include parents as recipients, particularly for messages related to meetings requiring their attendance. It allows the adviser to choose message templates from the available options, ensuring uniformity in the messages sent to recipients. This functionality enhances communication efficiency, allowing for quick and uniform dissemination of information to both students and their parents.

Figure 10. *Generate honor students*

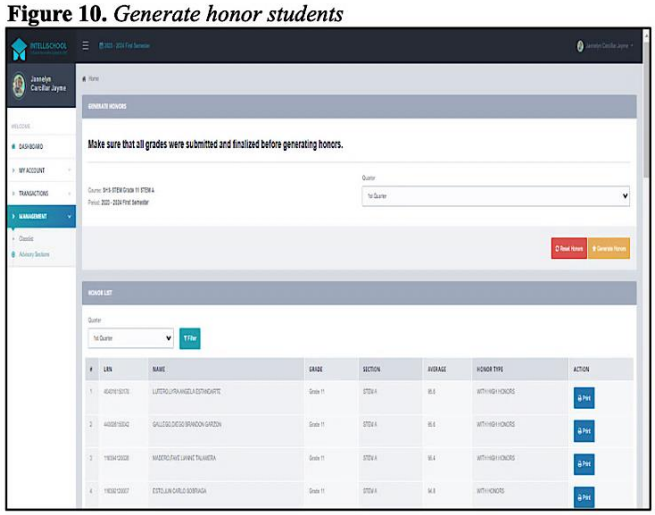


Figure 10 shows the *generate honors interface*. This provides advisers with the capability to identify honor students every quarter. Also, it includes buttons for both generating and resetting honors, offering flexibility in the process. Additionally, it allows advisers to filter the identified honor students for each quarter. This simplifies the recognition of outstanding academic performance, enabling advisers to efficiently manage and track honor students throughout the academic year.

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Figure 11. *Certificate of Recognition*

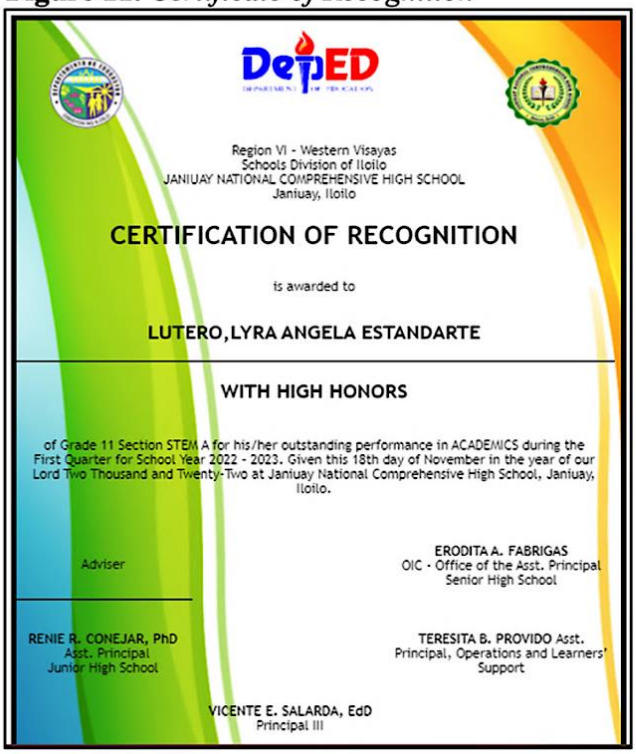

Figure 11 shows the *certificate of recognition*. This printable certificate feature enables advisers to produce certificates once honor students have been identified. This allows advisers to print certificates, serving as a tangible acknowledgment of students' academic achievements every quarter.

Figure 12. *Class List for Teacher*

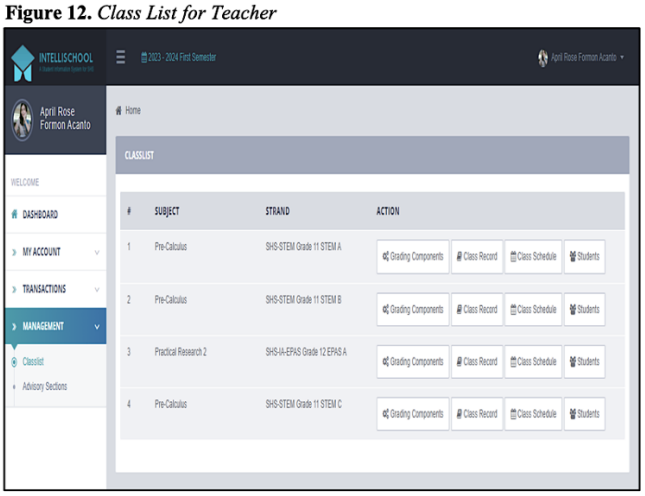

Figure 12 displays the *interface for the teachers' class list*. This is designed for teachers to oversee all their class sections. The list of classes is automatically available after the assistant principal assigns the said class or sections to the teacher. This enables the teacher to manage the grading components and class records, access the list of students in each class they teach, and view class schedules.

Figure 13. *Grade Criteria and Component*

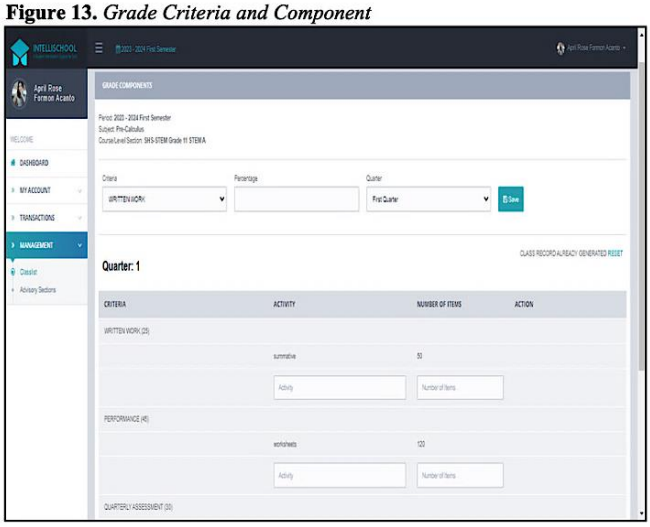

Figure 13 shows the *grade criteria and components interface*. This page adds grade criteria with components in the class record. It allows the teacher to add criteria with their corresponding percentage and specify components for each criterion with the number of items. These actions are essential in creating a class record for every subject and class the teacher teaches each quarter. All modifications or newly added grade component details are stored in the system database.

Figure 14. *Class Record*

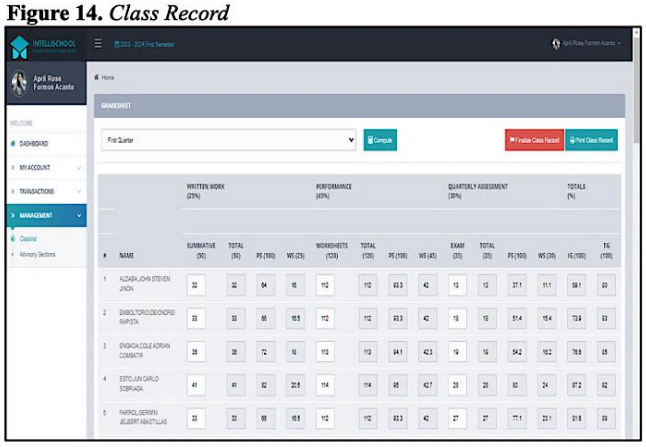

Figure 14 shows the *class record interface*. This manages class records for each class the teacher handles. It allows the teacher to encode the raw scores of each student in every component. After filling in the raw scores, click the compute button to automatically compute the initial and transmuted grade, and all updates or changes will be stored in the database. Then, the teacher will click finalize class record for the grade of each student to automatically appear in school form 9 and school form 10. An option to print class records is also available. If the teacher changes the class record, they need to notify the assistant principal to unfinalize their class record status so they can edit the entries in their class record. All modifications and updates to the class record will be stored in the system database.

5. PROJECT IMPLEMENTATION

Functionality Test of the Systems Technical Features. The test case determines if different features within a system are performing as expected and to confirm that the system satisfies all related standards, guidelines, and customer requirements [19]. It contains test steps, test data, expected results, and actual results developed for specific test scenarios to verify any requirement [20]. The test case was participated by five IT experts who thoroughly checked the system's functionality, which was identified and categorized based on the objectives of the study. The test case results of the system program and interfaces of the IntelliSchool: A Student Information System for Senior High School obtained a score of 100%, indicating a "passed" rating from all participants. The result emphasizes the system's effectiveness and approval

among the respondents, affirming its strong performance in meeting the requirements and expected functions.

Table 1. *Summary of the Mean Scores in the Functionality of the System*

No.	Features	Results	Remarks
1	Uploading of School Form 1 File	100%	Passed
2	Customizing a Web-based Class Record	100%	Passed
3	Generating School Form 9, School Form 10, List of Honor Students, and Certificate of Recognition	100%	Passed
4	Communicating with Parents	100%	Passed

Evaluation of the System Usability. The IntelliSchool: A Student Information System for Senior High School was evaluated using the Post-Study System Usability Questionnaire (PSSUQ). This is used to assess the system's perceived usability after users have interacted with it [21]. The PSSUQ version 3 consists of 16 questions with seven options. It followed a 7-point Likert scale from strongly agree to strongly disagree. PSSUQ score starts with 1 (strongly agree) as being high usability and ends with 7 (strongly disagree) as very low usability. The lower the score, the better the performance and satisfaction. PSSUQ was broken down into overall score, system usefulness (SYSUSE) score, information quality (INFOQUAL) score, and interface quality (INTERQUAL) score.

Thirty-five participants were selected to evaluate the SIS, comprising 2 assistant principals, 5 department heads, 2 advisers, 10 teachers, 1 scheduler, 10 students, and 5 parents. The PSSUQ results indicate highly positive feedback across various subscales, reflecting a strong agreement and positive user perception of the system's usability. Users strongly agree that the system is highly useful, with a mean of 1.11 in facilitating their tasks or objectives. This suggests that the functionality and capabilities of the system align well with the users' needs and expectations. The rating of 1.30 indicates strong agreement among users regarding the high quality of information the system provides. All users find the information accurate, relevant, and valuable, contributing to a positive overall experience. Users strongly agree that the system's interface is of high quality based on the mean of 1.21. This suggests that the design and user interaction elements are well-received, contributing to a positive user experience and efficient interaction with the system. The overall mean score of 1.21 reaffirms a strong agreement across all subscales, indicating that users have a favorable perception of the system as a whole.

Table 2. *Subscales overall PSSUQ Result*

Subscales	Mean	Verbal Description	Interpretation
System Usefulness	1.11	Strongly Agree	High Usability
Information Quality	1.30	Strongly Agree	High Usability
Interface Quality	1.21	Strongly Agree	High Usability
Overall	1.21	Strongly Agree	High Usability

Note: *1.0-1.9 (Strongly Agree); 2.0-2.9 (Agree); 3.0-3.9 (Partially Agree), 4.0-4.9 (Neutral); 5.0-5.9 (Partially Disagree); 6.0-6.5 (Disagree); 6.6-7.0 (Strongly Disagree)*

Implementation Plan. The SIS is implemented in the SHS during the First Semester of 2023-2024. The implementation employed a *parallel conversion approach*, allowing some teachers to continue using the old system alongside 15 teachers who adopted the new SIS. This method facilitates a gradual transition, ensuring the new system's smooth integration without disrupting the entire school's operations.

Before the actual implementation, a pilot testing phase for 5 days was conducted. Throughout the pilot testing, numerous issues arose, prompting a troubleshooting process to address and resolve encountered errors easily. Then, it was followed by all end-users' orientation. All users were required to attend, enabling them to acquaint themselves with the system's environment. Subsequently, a user training session followed, depending on the end-users' availability, providing them with hands-on experience tailored to their respective roles in utilizing the system.

The pilot implementation ran for 15 days. The system was integrated into a locally hosted network infrastructure, featuring a single server equipped with the SIS. Since the server is in the computer laboratory with an internet connection, end-users visit the computer laboratory for hands-on experience using the system. The implementation employed a role-based access control to ensure that each user can only access information and functions relevant to their role. This approach is crucial for maintaining the security and confidentiality of the data processed within the system.

Table 3 shows the challenges faced during the system's implementation, encompassing identified issues and the corresponding actions taken to address them. This table provides an overview of the problems encountered and a detailed account of the actions implemented to mitigate or resolve each issue, contributing to a more thorough understanding of the system's performance and troubleshooting efforts.

Table 3. *Problems and Actions Taken during Implementation*

	Problems		Action taken
1	The system cannot individually delete subjects from the section list; instead, this action must be performed by deleting subjects in the managed curriculum subjects. However, the list of subjects in each section does not automatically update after this deletion process in the curriculum area.	1	Created a process that ensures the list of subjects in each section is updated in real-time or periodically after any deletion occurs in the curriculum area. This prevents discrepancies and ensures that changes made at the curriculum level reflect accurately in all relevant strand sections.
2	Upon using an ordinary computer that serves as a server, the maximum execution time for generating class records, computing, finalizing, and printing class records is from 180 – 300 seconds.	2	The server was changed to an Intel Core i3 processor and SSD laptop, and the execution time is from 30 to 120 seconds.
3	School Form 9 and School 10 information is not yet complete.	3	Template for School Form 9 and School Form 10 information is already complete.
4	The information of other users cannot be edited.	4	A facility for editing user information and creating other users' accounts was provided in the admin account.
5	The system cannot change the signatories in the certificate of recognition,	5	Editing of signatories' names and uploading of signatures was provided in the admin account.

6. PROJECT MANAGEMENT

Project Cost Estimates. The system cost is Php 191, 160.00. The system's total development cost will be Php 280, 460.00 for the whole year of the development process. Each year, there will be an increase in the said amount including operational and maintenance costs, and the total increase will be computed based on the researcher's estimation. The total cost of the new system is 316, 860.00.

Project Cost-Benefit Analysis (CBA). It can be seen in CBA that the development and implementation cost for the project is Php 321,860.00. Over the project's lifetime, annual operation and maintenance costs increase by 10%. The present value of these costs, factoring in a 12% discount rate, is calculated, resulting in cumulative time-adjusted costs of Php 499,344.68 in the fifth year. On the benefits side, the new system is expected to generate benefits over five years, with increasing returns. These benefits are also time-adjusted and cumulatively presented. The cumulative lifetime adjusted cost (including benefits) demonstrates the financial impact, resulting in a positive Net Present Value (NPV) of Php 174,760.70. The Return on Investment (ROI) is 58.74%, and the Payback Period is estimated at 2 years and 4 months. Additionally, various cost-saving measures, such as reducing preprinted forms and improving productivity by 10%, contribute to a total benefit of Php 184,000.00.

Project Schedule. The researcher's Gantt chart was composed of 36 weeks to complete the system development process. The activities were based on the rapid application development (RAD) model. In each of RAD phases, there were specific activities that the researcher followed closely during the development of the SIS. The Program Evaluation Review Technique (PERT) chart is a project management

tool employed to plan, arrange, and harmonize project tasks [22]. The researcher constructed a PERT table and PERT Diagram to identify the slack time and critical path. In the PERT table, it was identified that activities involved in the system development, such as rapid prototyping, iterative development, continuous testing, user involvement, and integration of feedback, take three weeks each, and project documentation, which takes four weeks to finish and is considered as the longest path. All activities were considered critical because there was no occurrence of slack time.

Software requirements. The researcher used different software technologies to develop the system such as CodeIgniter, MySQL, JQuery, and Code Espresso SMS Gateway. *CodeIgniter* is a widely used and open-source platform that enables developers to create websites and applications easily using the PHP framework to quickly build dynamic applications with valuable code-writing features [23]. PHP is a programming language that enables one to connect and operate various databases when building a website [24]. *CodeIgniter* was used to develop a SIS for various plug-ins to choose from, modules, libraries, and other resources to provide users with a dynamic and user-friendly environment. *MySQL* is the most used database system in conjunction with PHP and is highly efficient, dependable, and user-friendly. MySQL is used in a SIS as a server database system.

JQuery is a fun and lightweight JavaScript toolkit that offers various techniques for modifying CSS differently [25]. *Code Espresso SMS Gateway* is an Android SMS server integration which allows users to send and receive SMS messages through an external SMS gateway provider using the Android device as a server [26]. This is useful in a SIS when there is a need to send large volumes of SMS messages, or the user wants to integrate SMS functionality into the system.

Hardware Requirements. Table 4 provides a detailed list of the hardware components that were utilized during the SIS implementation. This table includes information about the hardware, such as computers, servers, networking equipment, and any other devices or infrastructure that were essential to the successful system deployment and operation. These hardware components would have been crucial in supporting the software and data.

Table 4. *Hardware Specifications*

Hardware	Minimum Requirements	Specifications
Server Computer	Processor	Quad Core
	Memory	8 GB
	Hard Disk	1 TB
Client Computer	Processor	Dual Core
	Memory	4 GB
	Hard Disk	500 GB
Monitor	20" LCD Display	
Mouse	Any compatible mouse	
Keyboard	Any compatible keyboard	
Router	300Mbps at 2.4 GHz, ADSL 24/3.3 Mbps speed	
Wi-Fi Extender	300Mbps Universal Wi-Fi Range Extender	
Printer	3 in 1 Printer	
Postpaid Phone	Android Phone	

7. RISK MANAGEMENT

Project Risks. The researcher used categories of risk to identify the probability, impact, and management of the risk. First, the researcher identified the following risks: Business risk (BU), project risk (PD), customer risk (CU), and supplier risk (SP). Second, the researcher assessed each risk. Business risk (BU) could involve factors that impact the overall success and sustainability of the educational institution which may include changes in enrollment trends, shifts in educational technology, budget constraints, or evolving regulatory requirements [27]. Project risk (PD) would revolve around uncertainties that could affect the successful system creation and implementation like technical challenges, scope changes, delays in development, or unexpected resource limitations [28].

Customer risk (CU) could involve challenges related to the end-users' expectations and needs, such as students, parents, teachers, and administrators. Uncertainties might arise from misunderstandings of user requirements, changes in priorities, or resistance to adopting the new system [14]. Supplier risk (SP) could be caused by external partners providing essential components or services, such as software platforms, hardware components, or consulting services. These risks might include potential delays, quality issues, and availability of materials in the market [29]. Table 5 shows the possible risks that could cause the system failure.

Table 5. *Risk Table of Student Information System*

ID	Risk	Category	Probability	Impact
R1	Underestimation of the System Cost	BU	25%	3
R2	Underestimation of the System Scope	PD	25%	3
R3	Delayed delivery of the System	CU	40%	2
R4	Difficulty in understanding the System tools	SP	30%	3
R5	Lack of technical staff to maintain the System	BU	30%	2
	Change of School Management	BU	50%	1

1-catastrophic *2-critical* *3-marginal* *4-negligible*

Risk Mitigation, Monitoring, and Management. Risk mitigation focuses on reducing the impact of risks. Risk monitoring involves ongoing observation and assessment of risks. Risk management encompasses the overall process of identifying, addressing, and overseeing potential challenges, developing plans to address them, and executing these plans to ensure the system's success [30]. Table 6 shows the strategy in addressing the issues of underestimating system costs. It is critical to conduct a complete budget estimation to ensure an accurate understanding of the cost before presenting it to the accommodating organization. Any alterations to the estimated cost within the organization can make cost estimation less dependable.

Table 6. *Underestimation of the System Cost*

Description	Probability	Mitigation	Monitoring	Management
Underestimating system costs can pose challenges when presenting the proposed budget.	25% Cost (316,860.00) Exposure (79,215.00)	1. Identify any potential unexpected financial risks associated with the development. 2. Analyze and track all the expenditures made by the researcher.	1. Examine and assess the project paper's cost and benefit analysis. 2. Record and keep financial statements current and accurate.	1. The researcher must seek financial support to cover the system's expenses. 2. The researcher allocates its resources primarily towards covering the system's expenses.

Table 7 shows methods for mitigating the risk of comprehending the system's scope. Developers should identify the system's functional constraints to align with the organization's requirements. It also emphasizes the researcher's responsibility to deliver the system punctually while fulfilling all necessary functionalities.

Table 7. *Underestimation of the System Scope*

Description	Probability	Mitigation	Monitoring	Management
The occurrence of this risk involves additional project requirements resulting in modifications to the project's scope. It encompasses including features in the system that were not part of the initially agreed-upon scope.	25% Cost (316,860.00) Exposure (79,215.00)	Employ brainstorming techniques to create a clear picture of the system's content and functionality. Anticipate any potential areas of the system that may have uncertain or undefined boundaries.	Check and assess whether the researcher is following the right path in breaking down the system. Document the specific information that has been covered in the discussion.	Allocate additional time for the system development process. Talk about the system's extent with the advisor and consultant.

Table 8 shows an overview of the pre-system development planning process, highlighting the transformation of plans into potential risks and how they can be prevented. It also acknowledges that researcher idleness can be a risk factor. Effective time management and thorough monitoring of details are essential to prevent delays in meeting the required deadlines.

Table 8. *Delayed Delivery of the System*

Description	Probability	Mitigation	Monitoring	Management
The system's reliability may be compromised due to an unpredictable schedule, resulting from limited time dedicated to system development.	40% Cost (316,860.00) Exposure (126,744.00)	Carefully plan the PERT method to establish a scheduling foundation. Prepare a schedule of tasks.	Examine and assess the PERT table to verify if the researcher is on track. The researcher should adhere to the established schedule.	Agree for an extension of working hours. Fast-track system development by working twice as quickly.

Table 9 shows the transformation of inexperienced project staff into potential risk and outlines the measures taken to address this risk during project development. To mitigate this risk, it is essential to design the system to be user-friendly, ensuring that users can easily operate it without errors and generate accurate transaction reports.

Table 9. *Difficulty in Understanding the System Tool*

Description	Probability	Mitigation	Monitoring	Management
The risk of staff difficulty in understanding the system requires that the developer start in a way that is straightforward and user-friendly, making it easy for users to grasp and quickly learn how to operate the system.	30% Cost (316,860.00) Exposure (95,058.00)	Participate during user training schedule at school. Increase the amount of time dedicated to studying the system tool.	Perform a dry run of the developed system. Share partial results with the adviser and consultant.	Include additional personnel in the development process. Compensate a developer for the system development.

Table 10 provides information about the deficiency of technical staff available to maintain the system. It likely includes data or details regarding the shortage of personnel with the necessary technical skills and expertise to ensure the smooth operation and ongoing system maintenance. The table serves as documentation of this staffing issue and may offer insights into the potential challenges or risks associated with a lack of technical support for the system.

Table 10. *Lack of Technical Staff to Maintain the System*

Description	Probability	Mitigation	Monitoring	Management
The lack of technical staff to maintain the system indicates a shortage of qualified personnel with the necessary expertise and skills to ensure the proper operation and maintenance of the system.	30% Cost (316,860.00) Exposure (95,058.00)	Identify and provide training to existing staff members with related skills. Consider outsourcing specific maintenance tasks to third-party service providers.	Regularly review the workload and tasks assigned to the existing technical staff to ensure they can handle the responsibilities effectively and without overextension. Establish key performance indicators (KPIs) and metrics related to system maintenance to identify any trends or issues that may arise due to the staff shortage.	Clearly define and prioritize system maintenance tasks and focus on the most essential functions first. Explore options for reallocating existing resources and potentially outsourcing non-critical maintenance tasks to ensure that available staff can effectively manage the most important aspects of system maintenance.

Table 11 provides insights into a significant risk related to changes in management. This risk focuses on when new management takes over. There is a concern that they may not support the SIS. The consequence of this lack of support could potentially render the system non-functional. In essence, the risk is that the new management's decisions or actions might lead to the neglect, disinvestment, or abandonment of the system, resulting in its inability to operate effectively. This table likely further details the implications, likelihood, and potential mitigation, monitoring, and management strategies for this specific risk to help stakeholders understand and address the challenges associated with change in management.

Table 11. *Change of School Management*

Description	Probability	Mitigation	Monitoring	Management
A change in school management poses a risk of potential disruption to established processes, requiring adaptation and potential delays in system implementation and user adoption.	50% Cost (316,860.00) Exposure (158,430.00)	Develop a comprehensive transition plan that outlines the smooth transfer of responsibilities, including system support, from the outgoing to the incoming management. Engage with key stakeholders, such as the new management, teachers, and staff, to communicate the value and importance of the system.	Regularly monitor KPIs to detect any signs of declining system support or functionality due to the management change. Implement feedback channels for teachers, staff, and students to voice concerns or issues related to the system's functionality and support.	Develop a strong change management plan that addresses the potential impact on the school's systems, processes, and technology. Implement continuity measures, such as documenting critical processes, system configurations, and responsibilities, to ensure that the school's systems remain operational and well-supported during the management change.

8. SOFTWARE METRICS

In this study, the researcher used Function-Oriented Metrics as software metrics to measure certain aspects or characteristics of a software piece or its specifications. In the function points, Fi is seen as a complexity adjustment factor. It is determined by evaluating responses to specific questions, and these responses are rated on a scale from 0 to 5. On this scale, 0 indicates no influence, 1 for incidental, 2 for moderate, 3 for average, 4 for significant, and 5 for essential. This rating helps assess the complexity of the system based on the significance of these factors. In the fourteen (14) questions, the count total (Fi) is 53. This table also shows the estimated relative size and complexity of the software, which is 1885. This is equivalent to Php 191,160.00 as the estimated system cost based on the function point.

9. CONCLUSION AND RECOMMENDATIONS

Based on the functionality test of the system's technical features aligned with the study's objectives, the system program and interfaces achieved a “passed” rating from all participants. The result emphasizes the system's effectiveness and approval among the respondents, affirming its strong performance in meeting the requirements and expected functions. The system usability evaluation revealed highly positive feedback across various dimensions, indicating a strong consensus and positive user perception of the system's usability. End-users express appreciation for the system's functionality and additional features, highlighting its significant role in simplifying tasks, expediting processes, and embracing an environmentally friendly, paperless approach. In essence, the system fulfills its intended nature and purpose after pilot implementation. In terms of the system, it is recommended to use a server to accommodate users' needs without sacrificing the system's performance. For end-users, it is recommended for them to participate in user training sessions to acquire comprehensive skills in navigating the system, troubleshooting common issues, and understanding their roles and responsibilities. Lastly, for future researchers, additional recommendations include incorporating a payment system into the student information platform, allowing students to conveniently settle their contributions through various payment gateways like GCash and Maya.

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